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Programs
TRAMO and SEATS
Update: December 1995

VÍCTOR GÓMEZ
and
AGUSTÍN MARAVALL

European University Institute, Florence

EUROPEAN UNIVERSITY INSTITUTE, FLORENCE

ECONOMICS DEPARTMENT

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BADIA FIESOLANA, SAN DOMENICO (FI)

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European University Institute
Badia Fiesolana
I – 50016 San Domenico (FI)
Italy

Programs

TRAMO

"**T**ime Series **R**egression with **ARIMA** Noise, **M**issing Observations, and **O**utliers"

and

SEATS

"**S**ignal **E**xtraction in **ARIMA** **T**ime **S**eries"

Update: December 1995

Abstract

This document contains an update of the User Instructions for the programs TRAMO ("**T**ime Series **R**egression with **ARIMA** Noise, **M**issing Observations, and **O**utliers") and SEATS ("**S**ignal **E**xtraction in **ARIMA** **T**ime **S**eries"). Some of the new features are the following: Both programs can now be run in an entirely automatic manner, with a fast or a detailed identification procedure; the maximum number of observations has been increased to 600; the restrictions in the orders of the polynomials previously required by SEATS have been removed; and a new "business cycle" component has been added.

Víctor Gómez
Subdirección General de Planificación Económica, Ministerio de Economía,
Pº Castellana, 162, E–28046 Madrid, Spain
Tel.: +34–1–583.34.39, Fax: +34–1–583.73.17

and

Agustín Maravall
European University Institute, Badia Fiesolana, I–50016 S. Domenico (FI), Italy
Tel.: +39–55–46.85.347, Fax: +39–55–46.85.202,
E-mail: maravall@datacomm.iue.it

Contents

1 Introduction

The following notes describe some changes and additions to the User Instructions Manuals contained in the following EUI ECO Working Papers:

- "Program TRAMO: **T**ime Series **R**egression with **A**RIMA Noise, **M**issing Observations, and **O**utliers — Instructions for the User", GÓMEZ, V. and MARAVALL, A., EUI Working Paper ECO No. 94/31, Department of Economics, European University Institute, September 1994.
- "Program SEATS (**S**ignal **E**xtraction in **A**RIMA **T**ime **S**eries) — Instructions for the User", MARAVALL, A. and GÓMEZ, V., EUI Working Paper ECO No. 94/28, Department of Economics, European University Institute, September 1994.

As the following pages illustrate, the changes and extensions have been substantial. In fact, the two programs, TRAMO and SEATS, are still being modified and the next version will be hopefully released early next year. At present, the versions of the two programs are Beta versions, still preliminary, and at the testing stage. The authors kindly request that they be notified of possible errors detected in the programs. Since our team is very small, our capacity for testing is rather limited, and hence help is deeply appreciated.

2 Hardware Requirements

These versions of SEATS and TRAMO are compiled with the Microway NDP Fortran486 - Ver. 4.2.5 and Microsoft Fortran77 Ver. 5.0, linked with the Microway 486 Linker Ver. 4.2.5 and Microsoft Fortran77 Linker Ver. 5.0.

The present releases break the 640K barrier by utilizing the full 32–bit addressing mode available on 80486 machines; they can run only on 80486–based computers (also PENTIUM) that have at least 4 MB of extended memory.

Executing SEATS and TRAMO requires the following hardware:
- an Intel 80486 or PENTIUM–based IBM–compatible PC;
- a 3.5" diskette drive;
- a hard disk with about 2 MB of free space;
- at least 4 MB of extended memory;
- MS–DOS V3.3 or greater;
- a video graphics adapter VGA, EGA, CGA (color video is recommended).

When SEATS or TRAMO are running, they use the kernel extender of Microway compiler, which is uncompatible with EMM386 and

EMS386 of DOS. So before using SEATS or TRAMO, be sure that the definitions of these memory managers are not present in your CONFIG.SYS.

Note 1: When the execution of TRAMO or SEATS finds an NDP error, the file containing the error is stored in the file *report.bug*, and the program proceeds.

Note 2: At present, the two programs are compiled for a **maximum number of 600 observations** per series (this limit can be easily modified).

3 Command–Line Options

For the two programs, some options can be directly entered in the command–line. These options are the following:

$-s$	(Silent–mode) no output is seen in the screen during execution.
$-o$ *outpath*	Specifies the directory where the output file should be stored (when not used, the output file goes to the directory OUTPUT; see Section 2.4 of User Instructions).
$-i$ *filename*	Specifies the name of the input file (when not used, the input file is always '*series*'; see Section 2.3).
$-g$ *graphpath*	Specifies the directory where the files for the graphics should be stored. (In DOS this option should not be used because the graphics programs only look in the directory GRAPH.) In the case of SEATS, care should be taken that the subdirectories SERIES, ACF, SPECTRA, FILTERS, and FORECAST are present in the specified path.
$-OF$ *filename*	Specifies the name of the output file. This file contains all the program output. Thus, even when ITER $\neq 0$, the two programs contain a single output file each, with all the results for the processed series. The name of this file is '*filename.out*'.

With this option, the files with extension *.tre*, *.sa*, *.cyc* in SEATS, or *.ser*, *.lin* in TRAMO, disappear and instead a single file, '*filename.cmp*' is created. Its structure will be

⋮	⋮	⋮
seriename		
TREND	SA SERIES	CYCLE
xxxx	*xxxx*	*xxx*
− − −	− − −	− − −
xxxx	*xxxx*	*xxx*
seriename		
TREND	SA SERIES	CYCLE
xxxx	*xxxx*	*xxx*
− − −	− − −	− − −
xxxx	*xxxx*	*xxx*
⋮	⋮	⋮

and similarly for TRAMO.

Warning: Options are case sensitive!

Example: C : \> SEATS $-s$ $-i$ alp $-o$ C : \temp $-OF$ alpout

4 Routine Use on Many Series: The *RSA* Parameter

A facility has been introduced for routine treatment (for example, routine seasonal adjustment) of a large number of series. This is controlled by the three input parameters *RSA*, *QMAX*, and *DVA*.

Parameter		Meaning	Default
QMAX	= k	A positive number, which controls the sensitivity of the routine procedure (see below). The parameter *QMAX* is only active when $RSA \neq 0$.	$50^{(*)}$

(*) The default value of *QMAX* depends on *MQ*. For $MQ \geq 6$, $QMAX = 50$; for $MQ = 4, 3$, and 2, $QMAX = 36$, 30, and 24, respectively.

DVA	= k	A (small) number to control the criteria for outlier detection in automatic applications (see below).	0

RSA	$= 0$	Parameter inactive.	0
	$= 1$	Fast routine procedure. The program TRAMO automatically sets the following parameters: $LAM = -1$, $INTERP = 1$, $IATIP = 1$, $AIO = 2$, $VA =$ see below, $NOADMISS = 1$, $SEATS = 2$.	
	$= 2$	As before, but the following parameters are added: $IEAST =$ -1, $ITRAD =$ -1.	
	$= 3$	Detailed routine procedure. As $RSA = 1$, but the following parameters are added: $INIC = 3$, $IDIF = 3$.	
	$= 4$	As $RSA = 3$, but the following parameters are added: $IEAST =$ -1, $ITRAD =$ -1.	

The parameter VA is also set, but its value depends on the number of observations (NZ), in the following way:

$$\begin{array}{rrrl} & NZ & \leq 50, & VA = 3 + DVA \\ 50 < & NZ & \leq 150, & VA = 3.3 + DVA \\ 150 < & NZ & \leq 250, & VA = 3.5 + DVA \\ 250 < & NZ & \leq 400, & VA = 3.7 + DVA \\ 400 < & NZ & & VA = 4 + DVA. \end{array}$$

(By default, $DVA = 0$.)

Therefore, **when $RSA = 1$**, the program automatically tests for the log/level specification, interpolates missing values, corrects for three types of outliers, and estimates the default ("Airline") model, which is passed on to SEATS. SEATS checks the autocorrelation of the residuals. If the Ljung–Box Q statistics is larger than $QMAX$, two other models are estimated, within SEATS, to the series linearized by TRAMO, and the results are compared. The one that provides the best fit is chosen. If the model does not provide an admissible decomposition, it is automatically approximated by a decomposable one.

When $RSA = 2$, the same fast routine procedure is followed, except that the pretests for Trading Day and Easter effects are included. This is done by running a regression on the Trading Day and Easter variables, with the noise following the default model.

When $RSA = 3$ (Detailed Routine Adjustment), the program TRAMO automatically sets the same parameters for the case $RSA = 1$, and adds:

$$INIC = 3, \quad IDIF = 3.$$

In this case, thus, the automatic model identification procedure in TRAMO is used to determine the model. As before, nondecomposable models are approximated in SEATS. **When $RSA = 4$**, the detailed procedure is followed, but pretests for Trading Day and Easter effects are included. (The model ultimately selected will be retested for both types of effects.)

Note 1: When $RSA \neq 0$, the user can still enter the following parameters: *MQ, DVA, OUT, MAXBIAS, XL, QMAX, IMVX, IDUR, ITER,* plus the parameters for regression variables entered by the user.

Note 2: $RSA \neq 0$ requires $MQ \neq 1$
$RSA = 2, 4$ requires $MQ = 12$.

Note 3: If there are missing observations, $LAM = -1$ and/or $ITRAD < 0$ and/or $IEAST = -1$, *INTERP* should not be 1.

5 Control of the Output File

In TRAMO and SEATS, the output file is controlled with the following parameter:

Parameter		Meaning	Default
OUT	= 0	Full output file.	0
	= 1	Reduced output file.	
	= 2	Very brief summary.	
	= 3	No output file.	

When the two programs are used together, *OUT* is entered in TRAMO, and passed on to SEATS through the file *seats.itr*.

6 Program TRAMO

a) Section 3.1 — ARIMA Model

Pretest for the log vs. level specification

The program can pretest for the level–versus–log specification. This is controlled as follows:

Parameter		Meaning	Default
LAM	= 0	As before (logs).	(D)
	= 1	As before (levels).	
	= -1	The program tests for the log–level specification.	

The test is based, first, on the slope (b) of a range–mean regression, "trimmed" to avoid outlier distortion. This slope b is compared to a constant (β), close to zero, that depends on the number of observations and on the value of *RSA*. When the results of the regression are unclear, the value of *LAM* is chosen according to the *BIC* of the default model, using both specifications.

Note 1: The value *LAM* = -1 is recommended for automatic modelling of many series.

Note 2: The value β increases when $RSA > 0$, so as to favor the choice of the log transformation when a large number of series are routinely adjusted.

b) Section 3.2 — Automatic Model Identification

The orders of the polynomials associated with the different values of the parameter *INIC* have been changed as follows.

Parameter		Meaning	Default
INIC	= 0	As before.	(D)
	= 2	The program searches for regular polynomials up to order 2, and for seasonal polynomials up to order 1.	
	= 3	The program searches for regular polynomials up to order 3, and for seasonal polynomials up to order 1.	
	= 4	The program searches for regular polynomials up to order 3 and for seasonal polynomials up to order 2 (not input if *IDIF*=0).	

When TRAMO is run with $SEATS \neq 0$, if $INIC = 4$, it is automatically changed to $INIC = 3$.

c) Section 3.3 — Estimation

The following parameter has been added:

Parameter		Meaning	Default
$IGRBAR$	$= 1$	Graph of autocorrelations printed.	
	$= 0$	Graph of autocorrelations not printed.	(D)
$TSIG$	$=$	t–value above which the mean should be included in the model.	1.2

d) Section 3.4 — Forecasting

A new input parameter has been added to the case in which $LAM = 0$.

Parameter		Meaning	Default
$LOGN$	$= 0$	Levels are obtained as exponents of the logs.	0
	$= 1$	Levels and Standard errors are obtained through the Lognormal distribution.	

Note 1: The forecast when $LOGN = 1$ is larger than the forecast for $LOGN = 0$, and the difference will increase with the forecast horizon.

Note 2: At present, when $SEATS \neq 0$, $LOGN$ is set $= 0$.

Out–of–Sample Forecast Test

The input parameter $NBACK$ has been modified as follows.

When $NBACK < 0$, then $(-\ NBACK)$ observations are omitted from the end of the series. The model is estimated for the shorter series, one–period–ahead forecast errors are sequentially computed for the last $(-\ NBACK)$ periods (without reestimation of the model), and an F–test is performed that compares the out–of–sample forecast errors with the in–sample residuals.

The forecast function is printed, as well as the one–period–ahead forecasts, together with the associated forecast errors.

Note: To be used with $NPRED > 0$.

When *NPRED* = *0*, if *SEATS* $\neq 0$, the forecasts of the series, as well as their standard errors, are computed and printed, up to the *TF*–step–ahead forecast ($TF = \max(8, 2\times MQ)$).

e) Section 3.6 — Outliers

e.1) Automatic Outlier Detection

Parameter		Meaning	Default
IATIP	= 1	Is as before, except that, after correcting for the outliers found in the first round, the program now performs a new automatic model identification, and a new search for outliers if the model has been changed. In this second round, the critical value *VA* is reduced by the fraction *PC*. If the second round does not provide a satisfactory model, a third round is carried out. (The model obtained with automatic identification is always compared with the default model.)	

As a consequence, the value *IATIP* = 2 has been removed.

e.2) When automatic detection and correction of outliers is performed (*IATIP* = *1*), the parameter (*AIO*) has been modified as follows.

Parameter		Meaning	Default
AIO	= 0	As before.	
	= 1	As before.	
	= 2	Additive Outliers, Transitory Changes, and Level Shifts are considered (Innovations Outliers are not included).	(D)
	= 3	Only Level Shifts and Additive Outliers are considered.	

When TRAMO is run with *SEATS* $\neq 0$, *AIO* = 2 is now the standard option. When *SEATS* $\neq 0$, if *AIO* = 0, it is automatically set equal to 2. Transitory Changes and Additive Outliers will be assigned in SEATS to the irregular component, and Level Shifts to the trend.

e.3) Two new parameters, *INT*1 and *INT*2, have been added. They define the interval (*INT*1, *INT*2) over which outliers have to be searched. By default

$$INT1 = 1; \qquad INT2 = NZ.$$

f) Section 3.7 — Regression

Easter, Trading Day and Holiday Effects

The program contains now a **pretest for Easter and Trading Day effects**; this is done by running a regression on the default model. In automatic model identification, if the model is changed, both tests are then redone. (When these effects are to be estimated, if the starting year in the input file contains only the last two digits, the program adds 1900 to this number.)

The values of the parameters *IEAST* and *ITRAD* are now as follows:

Parameter		Meaning	Default
IEAST	= 0	As before (no adjustment).	(D)
	= 1	As before (Easter effect adjustment).	
	= -1	The program pretests for Easter effect.	

The specification of the Trading Day effect has been made more flexible, to allow for effects of the type considered in Harvey (1989, p. 334). The possible values are now:

	= 0	No Trading Day effect is estimated.	(D)
ITRAD	= 1	# of (M, T, W, Th, F) - # (Sat, Sun) $\times \frac{5}{2}$.	
	= 2	As the previous case, but with length–of–month adjustment.	
	= 6	# M - # Sun, # T - # Sun, ..., # Sat - # Sun.	
	= 7	As the previous case, but with length–of–month correction.	
	= -1	As *ITRAD* = 1, but a pretest is made.	
	= -2	As *ITRAD* = 2, but a pretest is made.	
	= -6	As *ITRAD* = 6, but a pretest is made.	
	= -7	As *ITRAD* = 7, but a pretest is made.	

Length–of–month correction = # (total days in month) - 365.25/12.

A facility has been added to incorporate in an external file holidays that do not fall on Sunday (when *ITRAD* = 6, 7, -6, -7), or on a Saturday or Sunday (when *ITRAD* = 1, 2, -1, -2). The input namelist should contain the parameter:

a) when *ITRAD* = 6, 7, -6, -7,
IREG = # of regression variables + 6,

b) when *ITRAD* = 1, 2, -1, -2,
IREG = # of regression variables + 1,

where # of regression variables includes those entered by the user and the ones generated by the program.

A namelist *REG* has to be added, with the new parameter value:
IUSER = -2,
and *NSER* = 6 or 1, followed by a line with the name of the file from which the holidays will be read.

Note: The order of the regression variables in TRAMO is as follows.
Mean, Missing Observations (when appropriate), Regression variables entered by the user or generated by the program, Trading Day variables, Easter variable, and Outliers.

g) The File *'seats.itr'*

When the input parameter *SEATS* is not zero, TRAMO creates the file '*seats.itr*' as input file for SEATS (see Section 3.8 of September 1994 User Instructions). This file has the following structure.

First line:	Title of series.
Second line:	*NZ NYEAR NPER NFREQ.*
Next lines:	"Linearized" series. This is the original series, with the missing observations interpolated, the outliers corrected, and the effect of regression and intervention variables removed, including Easter and Trading Day effects. Thus, it is the series corrected for deterministic effects (except for the mean), and hence is the series that will be decomposed by SEATS into stochastic components.
Next lines:	Namelist *INPUT*, with the parameter values for SEATS.
Next lines:	A $(k \times 5)$ matrix, where: $k = NZ$ (the length of the series) $+TF$ where $TF = \max(8;\ 2 \times MQ)$. The first column of this matrix contains the original series for TRAMO. The second column contains the Level Shift outliers. The third column contains the aggregate effect of the Additive Outliers and the Transitory Changes.

The fourth column contains the Easter effect.

The fifth column contains the Trading Day effect.

For each column, the first NZ elements contain the "in–sample" values; the last TF elements contain the forecasts. (When $LAM = 0$, the effects are expressed as factors; when $LAM = 1$, as additive components.)

Next lines: (Only when $IREG > 0$).
A $(k \times 6)$ matrix, where k is as before.

The first column contains the regression variable effects that are to be considered a separate component in SEATS.

The second column contains the regression variable effects that are assigned to the trend.

The third column contains the regression variable effects that are assigned to the seasonal component.

The fourth column contains the regression variable effects that are assigned to the irregular component.

The fifth column contains the regression variable effects that are to be considered an additional component of the seasonally adjusted series.

The sixth column contains the regression variable effects that are assigned to the cycle.

For each column, the first NZ elements are in–sample values; the last TF are forecasts.

Note: Recall that, for its execution by SEATS, the file '*seats.itr*' should be transferred to the directory SEATS as '*serie*'.

h) Minimum Number of Observations

The minimum number of observations depends on MQ, on the particular model, and on the options requested. By default, if m denotes the minimum number of observations,

- for $MQ \geq 12$, $m = 36$
- for $MQ \leq 6$, $m = \max(12, 4 \times MQ)$.

If the number of observations satisfies these minima, but is not enough for some additional option requested, the option is removed and its default value reset.

7 Program SEATS

a) Allocation of Regression Effects

New input parameters have been added to determine to which component each of the regression effects should be assigned. If the number of regression variables is n, the parameter *REGEFF* can be entered in each one of the n namelists *REG*. The parameter determines to which component the regression variable is allocated, and can take the following values.

Parameter		Meaning	Default
REGEFF	= 0	The regression effect is a separate additional component; it is not included in the seasonally adjusted series.	(D)
	= 1	Regression effect assigned to trend. (An example could be the case of two alternating regimes, as captured for instance by the following regression variable: 8 REG *ISEQ* = 2, / 50 20 150 20 which creates a series of zeros, except for two stretches of 20 ones, starting at $T = 50$ and $T = 150$.)	
	= 2	Regression effect assigned to seasonal component. (An example could be a variable including national festivities.)	
	= 3	Regression effect assigned to irregular component. (An example could be an effect similar to that of a transitory change with positive parameter; that is, with effects having alternating signs.)	
	= 4	Regression effect is assigned to the seasonally adjusted series, but as an additional separate component. (An example could be if one wished to remove the effect of exchange rate variations before looking at the underlying trend of a variable.)	

Note 1: The regression variables with $REGEFF = 2, 3$, and 5, are centered by the program.

Note 2: When in a *REG* Namelist, $IUSER = -1$ and the external file has $NSER > 1$, the same *REGEFF* value will apply to all series in the file.

b) Top–Heavy Models (the case $Q > P$)

SEATS was restricted before to ARIMA (p, d, q) models in which the order of the

total autoregressive polynomial (including differences) was at least as large as the order of the moving average one; i.e., to models in which $P = p+d \geq Q$. This restriction has been removed, and models with $Q > P$ ("top–heavy" model) are decomposed in the following way.

A first decomposition is performed, whereby

$$\text{ARIMA } (P, Q) = \text{ARIMA } (P, P-1) + \text{MA } (Q-P).$$

The first component is not top heavy, and hence can be decomposed in the usual way. Let this decomposition be, in general,

$$\text{ARIMA } (P, P-1) = p_t + s_t + c_t + u_t,$$

where p_t, s_t, c_t, and u_t denote the trend, seasonal, cyclical, and irregular component. The MA $(Q-P)$ component, which represents stationary short–term deviations, is added to the cyclical component (see next section). The series is decomposed then, into a balanced trend model, a balanced seasonal model, a top–heavy cycle model, and a white–noise irregular. The first three components are made canonical (i.e., noise–free).

c) Cyclical Component

In the previous version, the cyclical component was forced to exhibit a periodic behavior for a cyclical frequency. More generally, and more in line with the definition of the business cycle in economic series, the cyclical component also incorporates now stationary deviations with respect to the trend. As seen in the previous section, a top–heavy model will contain the effect of a moving average component that will be assigned to the cycle. Further, autoregressive roots can now generate cyclical fluctuation also in the following way: A cutting point is defined for the modulus of the AR root; above that point, the root is part of the trend, below that point the root is part of the cycle. The cutting point is controlled by the following parameter:

Parameter		Meaning	Default
RMOD	= k	$(0 \leq k \leq 1)$ Cutting point for the modulus of an AR root.	.5

Thus, for example, by default the AR root $(1 - .8B)$ would be assigned to the trend, while the AR root $(1 - .4B)$ would go to the cycle.

Concerning the seasonal AR polynomial, when $BP > 0$ and $BPHI < 0$, letting ϕ denote the real positive root of $(-BPHI)^{\frac{1}{MQ}}$,

- when $\phi \geq k$, the AR root $(1 - \phi B)$ is assigned to the trend;
- when $\phi < k$, it is assigned to the cycle.

Concerning the regular polynomial, the allocation of the AR roots is as follows.

Roots of $\phi(z^{-1}) = 0$:

Real positive roots:	If modulus $\geq k$, assigned to trend. If modulus $< k$, assigned to cycle.
Real negative roots:	Assigned to seasonal. (If $MQ = 1$, root assigned to cycle.)
Complex roots:	Let ω denote the frequency of the root. If $\omega \in$ [a seasonal frequency $\pm EPSPHI$], assigned to seasonal. Otherwise, assigned to cycle.

As a consequence, besides components directly associated with cyclical frequencies, the cyclical component also includes now MA components, and AR components with small enough moduli. In this way, the cyclical component represents the deviations with respect to the trend of a seasonally adjusted series, in line with the concept of the economic business cycle (see, for example, Stock and Watson, 1988). This component is allowed to have unit roots for frequencies that are not seasonal, nor zero, a rather unlikely event.

When a cycle is present, the series is decomposed (in its additive form) into a trend, seasonal, cyclical, and irregular component. The cyclical component is also made canonical and the irregular component is white noise. Of course, the irregular component could be added to the cycle, yet it is hard to see how white noise could help cyclical analysis.

d) Smoothing of the Trend; Use of SEATS as a "Fixed Filter"

For the default model, a facility has been introduced to obtain a smoother trend without significantly affecting the seasonally adjusted series. This is done by simply decreasing the value of the parameter *TH (1)* of the MA factor $(1 + \theta B)$. It is controlled by two input parameters:

Parameter		Meaning	Default
SMTR	= 0	Inactive	0
	= 1	The trend is further smoothed.	
THTR	= k	$-1 < k < 0$	-.4

When $TH(1) \leq THTR$, nothing is done since the trend is already smooth enough. When $TH(1) > THTR$, it is replaced by $THTR$.

Note: Typically, the changes in $TH(1)$ have little effect on the seasonal component estimator, and hence on the seasonally adjusted series. Varying $TH(1)$ amounts thus to a redistribution of the latter into "trend + irregular" where, as the trend becomes smoother, the irregular component increases its variance and exhibits low–order autocorrelation, and hence displays more and more the characteristics of a cyclical component.

The use of SEATS with the default model, $SMTR = 1$, and some chosen (negative) value for $THTR$ (that reflects the prior belief on how smooth a trend should be), provides very well–behaved filters for the components, and can produce results close to those obtained with many ad–hoc filters, with the advantage of preserving a considerable capacity to adapt to the particular type of seasonality present in the series. This way of proceeding can be seen as the way SEATS can be used efficiently as a "fixed filter". This filter still depends on two parameters, which will adapt to the particular features of each series.

e) Automatic Bias Correction

For a multiplicative decomposition, whether or not the seasonally adjusted series is modified to exhibit the same annual means as the original series is controlled by the following input parameter.

Parameter	Meaning	Default
$MAXBIAS = k$	A positive number.	.5

When the average value of the differences (in absolute value) between the annual means of the original and seasonally adjusted series is larger than k, the parameter $BIAS$ is set equal to -1, and the correction is enforced. The number k is expressed in % of the mean level of the series.

f) Output File

In the most general case, the decomposition of the series that TRAMO/SEATS provide is the following one. (We use the additive version; the multiplicative one is identical, with "+" replaced by "×", and "component" replaced by "factor".) Letting SA denote "seasonally adjusted",

serie = final SA series + final seasonal component + separate regression component;

the latter is associated with the regression variables for which $REGEFF = 0$. Then,

final SA series = final trend + final irregular component + final cyclical component + other regression effects included in the SA series;

the latter is associated with the regression variables for which $REGEFF = 4$. Next,

final trend = stochastic trend + level–shift outliers + trend regression component ($REGEFF = 1$);

final irregular component = stochastic irregular + additive outliers + transitory–change outliers + irregular regression component ($REGEFF = 3$);

final cyclical component = stochastic cyclical component + cyclical regression component ($REGEFF = 5$);

final seasonal component = stochastic seasonal component + trading day + Easter effect + seasonal regression component ($REGEFF = 2$).

The decomposition covers the sample period and the $\max(8, 2 \times MQ)$–periods–ahead forecast function (MQ denotes the number of observations per year).

In accordance with the previous decomposition, the end of the ou;put file in SEATS contains (for the most general case) the following tables.

ORIGINAL (UNCORRECTED) SERIES

PREADJUSTMENT COMPONENT (aggregate one from TRAMO)

LINEAR SERIES (generated by ARIMA model)

Stochastic Components

SEASONAL COMPONENT

CYCLICAL COMPONENT

IRREGULAR COMPONENT

TREND COMPONENT

SEASONALLY ADJUSTED SERIES.

First, the table with the point estimators is given, followed by the table with the associated STANDARD ERRORS. Next, the program prints the tables of the

stochastic components' forecasts, as well as of the associated standard errors. Then follow the tables of

Deterministic Components

LEVEL–SHIFT OUTLIERS

TRANSITORY OUTLIERS (the sum of AO and TC)

TRADING DAY EFFECT

EASTER EFFECT

TREND REGRESSION COMPONENT

SEASONAL REGRESSION COMPONENT

IRREGULAR REGRESSION COMPONENT

CYCLICAL REGRESSION COMPONENT

OTHER REGRESSION COMPONENT IN SA SERIES

SEPARATE REGRESSION COMPONENT (not in SA series).

From the combination of the stochastic and deterministic components, the tables of FINAL COMPONENTS are obtained and printed, as well as those of their FORECASTS. This ends the program.

g) New Graphs and Associated Arrays

The arrays that produce the previous tables (i.e., the columns of the matrices in the file '*seats.itr*' constructed by TRAMO) can also be plotted with the program GRAPH. Accordingly, in the directory GRAPH, the following new arrays are available.

Meaning	Name of File

In GRAPH \SERIES:

Preadjustment factors (or components) from TRAMO:

Level Shifts	*paotrf.t*
Transitory Outliers	*paoirf.t*
Effect of Regression Variables with $REGEFF = k \quad (k = 0, 1, \ldots, 5)$	*paregkf.t*
Easter Effect	*paeasf.t*
Trading Day Effect	*patdf.t*
Total preadjustment factor	*preadf.t*

Note: When $LAM = 1$, the factors are the components, and the '*f*' before the '.' becomes a '*c*' (for ex., *paotrc.t*).

Final Components:

Seasonally Adjusted series	*safin.t*
Trend	*trfin.t*
Irregular factor (component)	*irfin.t*
Seasonal factor (component)	*sfin.t*
Cyclical factor (component)	*cfin.t*

In GRAPH \FORECASTS:

Forecasts of the Final Components:

Original uncorrected series	*funorig.t5*
Seasonally Adjusted series	*fsafin.t5*
Trend	*ftrfin.t5*
Irregular factor (component)	*firfin.t5*
Seasonal factor (component)	*fsfin.t5*
Cyclical factor (component)	*fcfin.t5*

8 Errata and Corrections

to the User Instructions for TRAMO and SEATS contained in the Working Papers 94/31 and 94/28

a) Working Paper 94/31 (TRAMO)

page	line	says	should say
9	11	"... series, the trend, and the seasonally adjusted ..."	"... original, outlier corrected, and linear ..."
11	Default value of P should be 0.		
13	2	"AR(1) $\times$ AR$_S$(1) ..."	"AR(2) $\times$ AR$_S$(1)..."
15	Default value of $INTERP$ should be 1.		
16	Default value of PC should be .14286.		
16	25	"when $IATIP = 2$"	"when $IATIP = 1$"
18	19	"... and is followed by ..."	"... and is followed (in a new line) by ..."
18	24	"$J_i = 1$"	"$J_i = IO$"
18	25	"$J_i = 2$"	"$J_i = AO$"
18	26	"$J_i = 3$"	"$J_i = LS$"
18	27	"$J_i = 4$"	"$J_i = TC$"

b) Working Paper 94/28 (SEATS)

page				
13	Default value of	XL	should be	$-.98$
13	Default value of	UR	should be	-1
14	Default value of	$NOADMISS$	should be	0
15	Default value of	OUT	should be	1
15	Default value of	HS	should be	1.5

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